



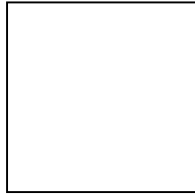
## *Exemplar 10 :* **Classification of Quadrilaterals**

- Objective :** Students will be able to examine symmetry and to classify quadrilaterals by the number of lines of symmetry.
- Dimension :** Measures, Shape and Space
- Learning unit :** Transformation and Symmetry
- Key Stage :** 3
- Materials Required :** Sets of quadrilaterals
- Prerequisite Knowledge :** Reflectional symmetries in 2-D shapes
- Main HOTS Involved :** Inquiring Skills, Conceptualizing Skills
- Description of the Activity :**
1. Divide students into groups.
  2. Give a set of quadrilaterals and a worksheet to each group.
  3. Ask students to sort the quadrilaterals into different categories according to the instructions stated in the worksheet. Students can fold the quadrilaterals to identify the line(s) of symmetry. Group discussion is recommended.
  4. Invite a representative from each group to present their findings. The teacher comments on them.
  5. Discuss with students the line of symmetry of a quadrilateral.

**Worksheet 10.1**

1. You are given different kinds of quadrilaterals as follows.

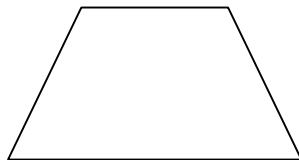
(a) Square



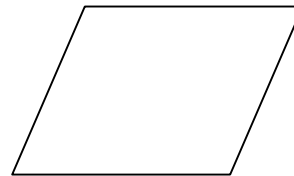
(b) Rectangle



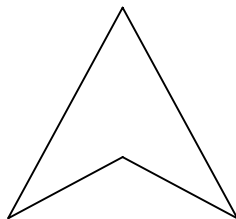
(c) Isosceles trapezium



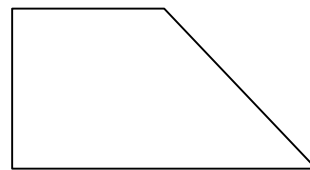
(d) Parallelogram



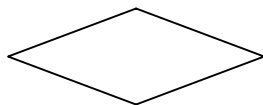
(e) Arrowhead



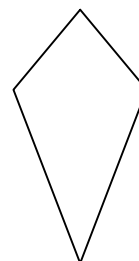
(f) Trapezium



(g) Rhombus

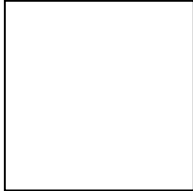

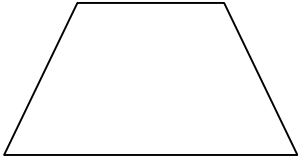
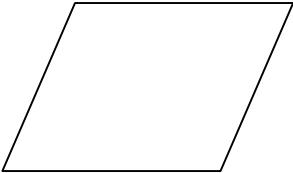
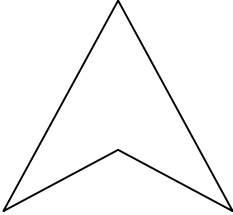
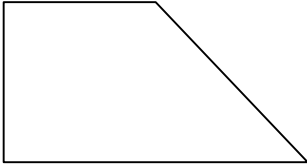
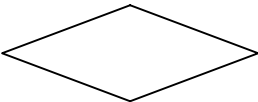


(h) Kite



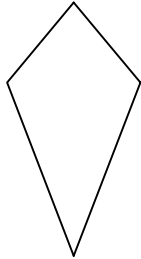
2. Try to find the line(s) of symmetry by folding the quadrilaterals.
3. Complete Table 10.1.

Table 10.1

	<b>Name</b>	<b>Please draw the line(s) of symmetry on the corresponding shape, if exists.</b>	<b>Number of lines of symmetry</b>
(a)	Square		
(b)	Rectangle		
(c)	Isosceles trapezium		
(d)	Parallelogram		
(e)	Arrowhead		
(f)	Trapezium		
(g)	Rhombus		

(to be continued, PTO)

Table 10.1 (continued)

	Name	Please draw the line(s) of symmetry on the corresponding shape, if exists.	Number of lines of symmetry
(h)	Kite		

4. Answer the following questions.

- (a) What do you notice about a line of symmetry on a rectilinear figure with respect to (i) an edge, (ii) a vertex?

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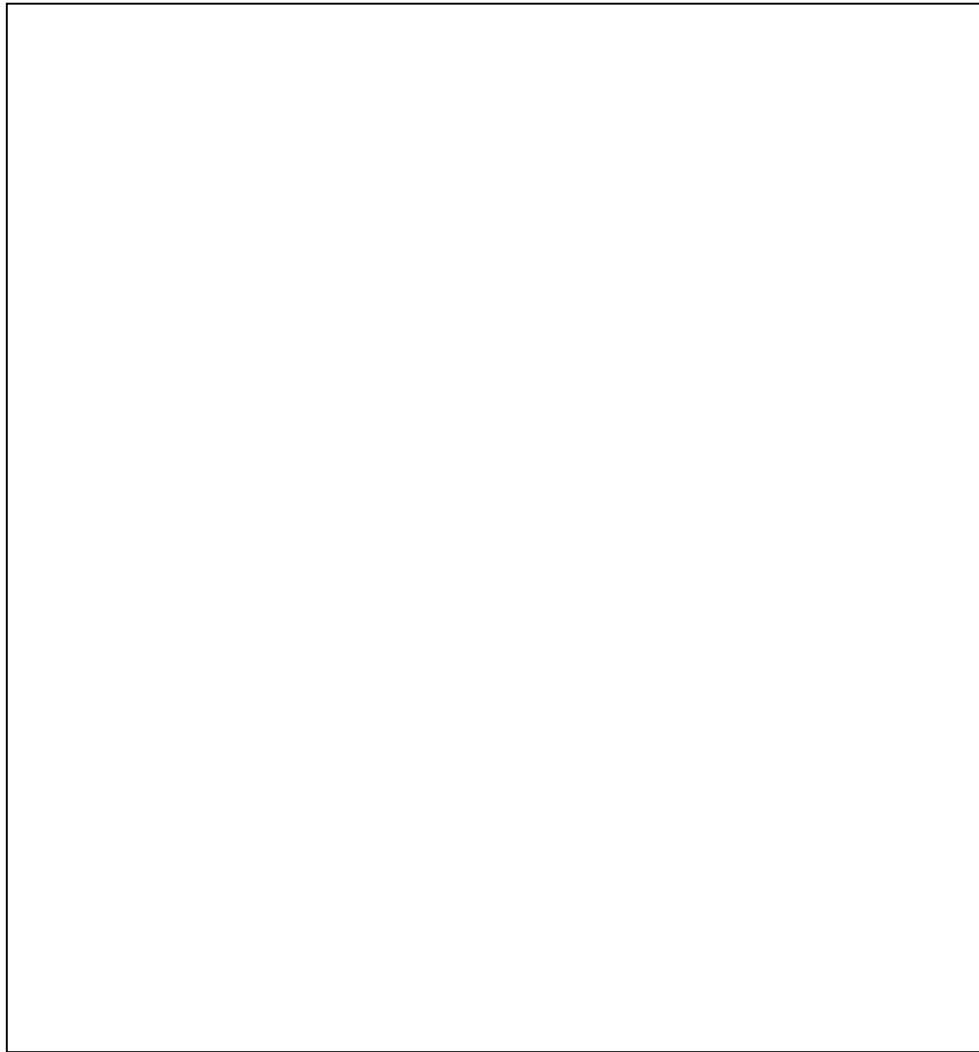
Can you draw some figures to illustrate the above fact?

(i)	
(ii)	

- (b) Choose a line of symmetry of a quadrilateral. It must either cut an edge/edges or pass through a vertex/vertices. How many different cases can be formed?

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Draw figures to illustrate the fact.



- (c) What kinds of quadrilateral can be formed under the cases described in part(b) above? Explain.

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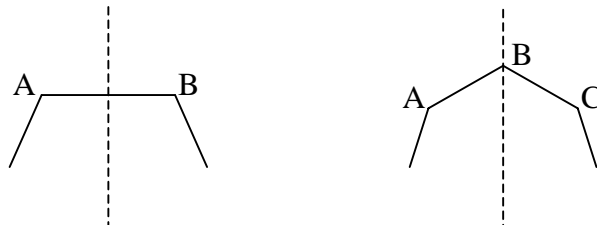
**Notes for Teachers :**

1. This exemplar is difficult. Sufficient guidance from the teacher is necessary.
2. Answers to question 3.

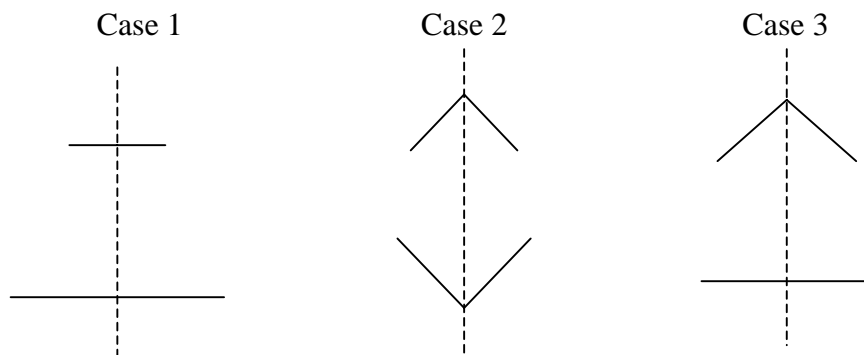
	Name	Number of line of symmetry
(a)	Square	4
(b)	Rectangle	2
(c)	Isosceles trapezium	1
(d)	Parallelogram	0
(e)	Arrowhead	1
(f)	Trapezium	0
(g)	Rhombus	2
(h)	Kite	1

3. Answers to question 4.

- (a) The line of symmetry is either the perpendicular bisector of an edge or the angle bisector of a vertex. Besides, all edges are symmetric about this line of symmetry. This can be illustrated in the following figures.



- (b) Three different cases can be formed.



## High Order

Thinking Skills

Exemplar 10

- (c) In Case 1, the line of symmetry is the perpendicular bisector of the two opposite sides. The vertices are also symmetric about the line of symmetry. As a result, only an isosceles trapezium, a rectangle or a square can be formed.
- In Case 2, as two vertices lie on the line of symmetry, only a kite, an arrowhead or a rhombus can be formed.
- In Case 3, no quadrilaterals of the above can be formed.
4. Through paper folding, students can find the line of symmetry by hands if it exists. More able students can identify it just by visualization and drawing.
  5. If students can finish their works correctly, they not only know the definition of symmetry but also build up the concept of symmetric quadrilaterals.